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A Critical Appraisal of the Opportunities currently available for a more Energy Conscious Approach to Residential Building in Ireland

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A Critical Appraisal of the Opportunities currently available for a more Energy Conscious Approach to Residential Building in Ireland

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Abstract

This paper focuses on the particular advantages which off-site housing construction has over the more traditional methods of building especially where the efficient use and conservation of energy is concerned. It will explain why modern innovative methods of house construction not only have a clear advantage environmentally (big reductions in CO2 emissions) but also deliver substantial benefits to the end user or householder especially in the form of lower energy bills.

The ecological argument for off-site systems is a very powerful one but on its own is still unlikely to be the prime driver for widespread implementation. That growth is more likely to come through government regulations and a package of finely tuned incentives. Consumer pressure will come from practical self interest when the true benefits to the householder in terms of comfort, efficiency and reduced energy costs are clearly seen and understood. This involves an awareness creation process and I will be making a practical proposal in this regard.

Key words; off-site-construction, heat conservation, housing policy, thermal transmittance.

Introduction

Economic Boom

DKM (2004) states no other economy in Europe has witnessed the kind of economic growth experienced in Ireland since the mid 1990s and one of the main beneficiaries of this growth has been the Construction sector. In Housing Statistics Bulletin 2004 (2005 stats awaited) housing output alone was almost four times greater than ten years earlier. Ireland is now building at a faster rate than anywhere else in Europe -19 units per 1000 of the population compared to 3.5 units per 1000 in the UK

Housing Output

By the end of 2004 it was estimated that total housing stock in the Republic of Ireland amounted to 1,600,000 units with 30% of these units having been built in the previous ten years. This equates to 400 houses per 1000 persons which is approaching the EU average of 450 per 1000 (department of Environment, Heritage and Local Government, 2004[1]). Obviously this extraordinary output of new homes could not have been achieved without greatly improved efficiencies in the construction process. The time required to produce a typical building in 2006 is estimated to be less than one third of what it would

have taken twenty years earlier. These efficiencies were mainly due to the widespread application of offsite construction systems (concrete, steel and timber) and greater use of mechanisation on site.

Off-site Construction

The small scale of the Irish market in the past meant that Ireland continued to rely heavily on the traditional load bearing brick and block work method of building but this is now giving way rapidly to other forms of construction involving significant elements of off-site construction. By off-site construction is meant the process whereby building components are factory produced off-site and speedily assembled on-site. The materials used are mainly concrete, timber and steel. From these three materials various construction systems have emerged. Some of these systems major on one material (e.g. timber frame houses) while others allow for the use of all three materials in various combinations (e.g. Pods). My focus here is on the application of these processes to what I will define as “low rise residential buildings”.

Housing Stats

While the official housing statistics provide an excellent overview of house completions each year in terms of size, value, geographic spread etc they do not classify output in terms of construction methods used. Most of the information and data emerging in this regard comes from the major players in the field (i.e. the manufacturers and promoters of the different systems) and their competing claims must therefore be subjected to a certain amount of critical scrutiny. From the latest figures available it is reasonable to assume that the breakdown in terms of primary material used in low rise residential buildings approximates as follows: timber 27%, pre-cast concrete 21% and steel 3% (Irish Timber Frame Manufacturers Association Official magazine “Frame it” –From strength to strength /Page. 4 &- Off-site Construction magazine Quarter 2, 2004 - Industry News/ Page. 8). This leaves 50% which it is fair to assume consists almost entirely of traditionally built brick and block work houses most of them built to an unacceptable standard and contributing no doubt in their own way to global warming.

Concrete Still Dominates

It is clear from these figures that cement, in one form or another, still dominates the Irish construction industry. It has traditionally enjoyed a high degree of acceptance in Ireland as the prime building material and the industry itself is one with significant influence and resources. Its current publicity slogan *“Concrete Built is Better Built”* is not one that everybody would necessarily agree with. Legitimate questions continue to be raised about the merits of cement as a low rise residential building material in a maritime climate such as we enjoy in Ireland. In recent years concrete has been criticised from two standpoints. Firstly that it requires a lot of energy to extract and refine it from its raw state into a finished building material and secondly a building traditionally constructed using concrete blocks is a very poor insulator of heat. These two criticisms indicate the traditional Irish method of constructing a house to be heavily energy dependant in both the construction phase and throughout the lifecycle of the buildings.

The building boom of recent years became a sellers market which gave rise in turn to a culture of buyers focused on what they could afford rather than the standard of what they were purchasing. This places an added responsibility on the Government to ensure that the regulatory system is adequate to maintain basic sustainable standards at least where energy use is concerned.

Building Regulations

After the 1976 oil crisis the Irish government enforced tighter building regulations particularly where the conservation of fuel and energy was concerned. These regulations were introduced to reduce the energy consumption of buildings and improve overall performance. Current levels set in 2002 require a building to have a thermal transmittance level of 0.27 u-value (Building Regulation 2002Technical Guidance Document Part L. Conservation of Fuel and Energy in Dwellings / Page. 9). Thermal transmittance (u-value) relates to a building component or structure, and is a measure of the rate at which heat passes through that component or structure when unit temperature difference is maintained between the ambient air temperatures on each side (Building Regulation 2002 Technical Guidance Document Part L. Conservation of Fuel and Energy in Dwellings / Page. 5).

Kyoto Protocol

These targets to increase levels in energy conservation have been driven by Agenda 21, the Kyoto protocol and various European Commission initiatives, such as the EU Directive on the Energy Performance of Buildings. This directive will lead to energy efficiency becoming an integral design issue for almost every category of building and will in time convert the energy performance of a building into a factor that significantly affects its monetary value.

Alternative Systems

Latest figures published estimate the construction industry is responsible for two thirds of Ireland's total CO2 gas emissions and the home heating systems is the biggest producer of these emissions. Poorly constructed homes using materials that allow vast amounts of heat to escape require more energy to run, resulting in more CO2 emissions. With traditional brick and block construction finding it hard to meet the new building regulation levels and increasing pressure from environmentalists to reduce the CO2 emission levels, builders began to look more and more towards energy saving alternatives which could meet the new regulatory levels. This gave a considerable boost to the various systems generically referred to as off-site construction.

Opinion Leaders

The earliest adopters of off-site type housing such as timber frame etc. were one off purchasers who reaped the benefits for their own use. While the initial motivation for many may have been ecological and idealistic they soon came to experience the practical benefits in terms of efficiency, economy and comfort and were well placed to act as effective opinion leaders. This represented a limited form of market pull in a sector dominated by the interests of producers. Factory production methods using other materials or a mix of materials also came to the rescue.

Controlled Environment

The practical benefits of off-site systems begin with the advantages that come from manufacturing in a controlled environment (i.e. factory). A factory eliminates weather dependency; quality control can be tightly monitored, and waste levels are typically reduced by up to 30% (Off-site Construction magazine Quarter 2, 2004 –Foundations in Off-site/ Page. 40). Through off-site construction an estimated building time can be reduced by up to 60% compared with conventionally constructed buildings and the user gets satisfaction in a well constructed energy efficient home that reduces energy consumption and Carbon Dioxide emissions over the buildings lifetime (Off-site Construction magazine Quarter 2, 2005 –A Framing Good Idea/ Page. 44).

The reduction in energy and waste levels associated with off site manufacturing are increasingly seen as both environmentally friendlier and more cost effective than traditional methods. The benefits here come from the added insulation and the air tight envelope used. The extra insulation simply increases the building's ability to retain heat for a longer period of time while the air tight envelope seals in the temperature giving high u-values. A home with a high performing u-value can heat up more quickly; hold the desired temperature longer and in doing so use only a fraction of the energy which is needed to heat a conventionally built home.

More Compliant Systems

Because of Ireland's commitment to the Kyoto protocol in keeping its CO2 emission levels at no more than 13% above the 1990 level, the building regulations on thermal transmittance will inevitably increase in the future. Off-site construction already meets existing requirements and is surpassing them with recorded u-values as low as 0.2 and in exceptional cases 0.144(Irish Timber Frame Manufacturers Association Official magazine "Frame it" –The Quality Challenge /Page. 30). With traditionally built houses finding the current levels hard to achieve and Kyoto pushing for improved levels the pressure on the construction sector will accelerate the move from what is sometimes disparagingly referred to as "bog standard concrete" towards more compliant systems.

From the current housing statistics it is reasonable to conclude that nearly 50% of all houses constructed today are still being built with poor energy ratings as a result of an outdated and inefficient system of construction. The total number of completed houses in 2004 amounted to 76,554 with an average life expectancy of at least sixty years (Building Regulation 2000 Technical Guidance Document Part D. Materials and Workmanship / Page. 5). This would suggest that another 35,000 to 40,000 homes were added to the housing stock which will go on being heavily energy dependant for about sixty years before they are replaced.

Consumer is not King

In marketing parlance the consumer is meant to be king exerting an upward pressure on standards. This is certainly not so where the house purchaser is concerned and with further economic growth and increases in the working population forecast this not likely to change in the foreseeable future. This puts an even greater emphasis on the need for Government to be more proactive where sustainable development is concerned. The lack of state action has been severely criticised by environmentalists especially where the one off private housing market is concerned. The critics maintain that there is still great potential for a big uptake in low energy using buildings and renewable technology in this sector. The interest is there but the costs are always prohibitive.

Government Incentives

Government incentives could be one part of the solution. It is surprising that there is still no grant aid available for people seriously interested in building say a well insulated, airtight, well glazed, low energy house. Other jurisdictions such as the UK provide a range of incentives for low energy demand houses in the private one off developments and it is argued that our Government should follow suit. Among the actions that could be taken are VAT reductions on renewable technology (0% in Germany 5% UK and 21% Ireland) grant aid for buildings with high energy ratings, interest free loans for the purchase of eco friendly systems etc.

DIT Opportunity

It is also clearly necessary to create a greater awareness of the benefits of the new systems among a much wider public. This in my view could best be achieved in a practical way by seeking to engage the attention of students who are likely to become future professionals and opinion leaders. One practical suggestion along these lines for example would be for the Dublin Institute of Technology in its relocation move to Grangegorman to factor in the construction of a dedicated state-of the art student residence built on best practice ecological lines. This would be capable of delivering high performance and energy efficient benefits. Students normally have very limited financial recourses and a large proportion of goes on rent, heating and other house running costs. They would readily come to see and appreciate the benefits of highly efficient and energy conserving heating systems. The residence benefits would seen and experienced by a continuous turnover of young people who coming as they would from a wide variety of disciplines would later have a powerful influence as opinion leaders, professionals etc in ensuring the implementation of best practice sustainable systems

Summary

1. The economic boom which Ireland has been experiencing in recent years has given rise to unprecedented growth and expansion in the construction sector.
2. This growth has not necessarily been beneficial to the environment in terms of Greenhouse gas emissions and it has come at a time when there is increasing pressure to reduce these emissions or face serious financial penalties.
3. We continue to be heavily reliant on the use of concrete as the primary building material and cement both in terms of extraction, production and end product use is a heavy user of energy especially the traditional brick and block method which still constitutes up to half of total housing output.
4. Great strides have been made however involving off-site construction systems and many of these for example timber frame are ecologically far more acceptable and eco friendly.
5. The challenge now is to further improve and exploit the energy conserving attributes of these systems and find ways of reducing the number of houses built in the more traditional and energy inefficient modes.
6. This report deals with some of the measures that might be implemented in the area of government incentives and in the more stringent application of regulatory standards.
7. The report makes a practical proposal which would help to produce a cadre of new opinion leaders and future professionals who could ensure the implementation of best practice sustainable systems in the future.

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